

Анализ связей между AS в сети Интернет

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Задание на дом

- С помощью утилиты traceroute и сайта bgp.he.net проследить цепочку автономных систем (Autonomous System, AS), через которые идут пакеты от вашего ПК до сайтов двух университетов, один из которых находится в Скандинавии, а другой – в Южной Америке (оба на ваш выбор)
 - 1) Получить трассировку маршрута (если в трассировке будет слишком много * * *, то возьмите другой ВУЗ)
 - 2) Определить номера автономных систем и названия соответствующих операторов в цепочке
 - 3) Определить, где использовался транзит, а где – пиринг через точку обмена интернет-трафиком (Internet Exchange Point, IXP или просто IX)
- См. далее 2 примера с финским и парагвайским университетами

Tampere University of Technology

The screenshot shows the homepage of the Tampere University of Technology website. The browser address bar displays 'www.tut.fi/etusivu'. The page features a green and white color scheme with a navigation menu at the top. The main content area is divided into three columns. The left column has a blue header 'Sähköntuotannon tulevaisuus on uusiutuvaa' and an image of a hand holding a globe with wind turbines and solar panels. The middle column has a green header 'Valoa pimeyteen -tiedetapahtuma 27.1.' and an image of a hand holding a globe with a map of Finland. The right column has an orange header 'Uutiset' and a photo of two people. The page also includes a search bar and a navigation menu with links like 'Etusivu', 'Tutkimus', and 'Tule opiskelemaan'.

File Edit View History Bookmarks Tools Help

Etusivu - Tampereen teknil... x +

www.tut.fi/etusivu

Mediaalle Alunneille Nykyisille opiskelijoille Henkilökunnalle Kirjaston palvelut Vierailijalle Töihin TTY:lle In English

TAMPEREEN TEKNILLINEN YLIOPISTO

Uutiset ja tapahtumat Henkilöhaiku

Hae sivustolta

Etusivu Tutkimus Tule opiskelemaan Yrityksille Tietoa yliopistosta

S Sähköntuotannon tulevaisuus on uusiutuvaa

Sähköntuotanto painottuu jatkuvasti enemmän uusiutuviin tuotantomuotoihin. TTY:n energia-alan tutkijat ovat olleet mukana laatimassa energia-alan tulevaisuuskenaariota Energiatieteellisyydelle. Sen selkeä sanoma on, että uusiutuvat energiantuotantomuodot

V Valoa pimeyteen -tiedetapahtuma 27.1.

Tampere 1918 – Maailma 2018. Valoa pimeyteen tiedetapahtuma katsoo satavuotiaan Suomen historiaan ja nykypäivään sekä pohtii Suomen roolia maailmanpolitiikassa.

Tampere-talon Sorsapuistosalissa päivän aiheisiin

U Uutiset

22.01.2018 15:44

[Tampere3-uudistuksen johtaja ja hankekehitysjohtaja valittu](#)

Nykyiset Tampere3-hankejohtajan tehtävät jaetaan henkilövaihdoksessa kahdelle henkilölle. Tampere3-hankkeen strateginen ohjausryhmä valitsi maanantaina 22.1. Tampere3-uudistuksen johtajaksi Anna-Kaisa Iksen

Утилита traceroute/tracert

- <https://ru.wikipedia.org/wiki/Traceroute>

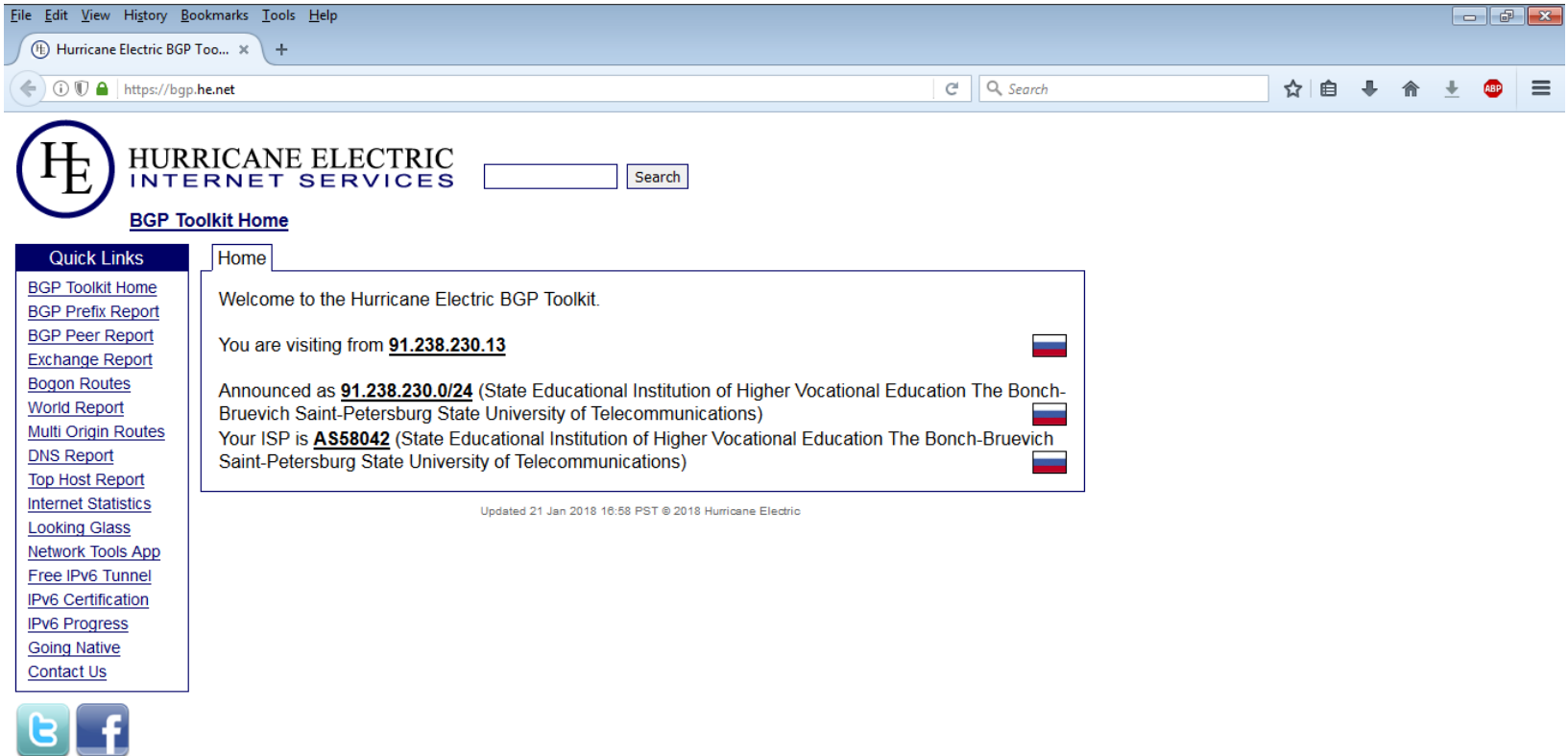
```
C:\Users\RAD>tracert www.tut.fi
```

```
Tracing route to www.tut.fi [130.230.137.61]  
over a maximum of 30 hops:
```

```
 1  *    *    *    Request timed out.  
 2  1 ms  1 ms  <1 ms  wifi.loc [172.16.1.1]  
 3  1 ms  1 ms  1 ms  gw-b22.spbsut.ru [91.238.230.1]  
 4  2 ms  2 ms  4 ms  p2p.85.235.198.53.ptspb.net [85.235.198.53]  
 5  2 ms  2 ms  2 ms  mx480-mm11.p2p.mx240-b57.ptspb.net [188.227.25.33]  
 6  9 ms  10 ms 10 ms  193.106.112.103  
 7  24 ms 20 ms 21 ms  80-64-96-229.rascom.as20764.net [80.64.96.229]  
 8  20 ms 20 ms 20 ms  80-64-96-229.rascom.as20764.net [80.64.96.229]  
 9  20 ms 20 ms 20 ms  se-fre.nordu.net [195.69.119.24]  
10  26 ms 26 ms 26 ms  ndn-gw.funet.fi [109.105.102.105]  
11  32 ms 28 ms 28 ms  tut6-et-0-1-0-1.ip.funet.fi [193.166.255.51]  
12  29 ms 28 ms 28 ms  surf-gw-xe-0-0-0.cc.tut.fi [130.230.1.238]  
13  29 ms 29 ms 29 ms  fw1.tut.fi [130.230.1.18]  
14  29 ms 29 ms 29 ms  tend-gw-vlan558.av.tut.fi [130.230.1.29]  
15  30 ms 29 ms 30 ms  www.tut.fi [130.230.137.61]
```

```
Trace complete.
```

Открываем сайт bgp.he.net



The screenshot shows a web browser window with the address bar displaying `https://bgp.he.net`. The page header includes the Hurricane Electric logo and the text "HURRICANE ELECTRIC INTERNET SERVICES" with a search input field. Below the header is a "BGP Toolkit Home" section with a "Quick Links" sidebar containing various tool links. The main content area displays a welcome message and identifies the user's IP address as `91.238.230.13` and their ISP as `AS58042`, both associated with the State Educational Institution of Higher Vocational Education The Bonch-Bruevich Saint-Petersburg State University of Telecommunications. The footer indicates the page was updated on 21 Jan 2018 at 16:58 PST.

File Edit View History Bookmarks Tools Help

Hurricane Electric BGP Too... x +

https://bgp.he.net

HE HURRICANE ELECTRIC
INTERNET SERVICES

Search

BGP Toolkit Home

Quick Links

- [BGP Toolkit Home](#)
- [BGP Prefix Report](#)
- [BGP Peer Report](#)
- [Exchange Report](#)
- [Bogon Routes](#)
- [World Report](#)
- [Multi Origin Routes](#)
- [DNS Report](#)
- [Top Host Report](#)
- [Internet Statistics](#)
- [Looking Glass](#)
- [Network Tools App](#)
- [Free IPv6 Tunnel](#)
- [IPv6 Certification](#)
- [IPv6 Progress](#)
- [Going Native](#)
- [Contact Us](#)

Home



Welcome to the Hurricane Electric BGP Toolkit.

You are visiting from **91.238.230.13**

Announced as **91.238.230.0/24** (State Educational Institution of Higher Vocational Education The Bonch-Bruevich Saint-Petersburg State University of Telecommunications)

Your ISP is **AS58042** (State Educational Institution of Higher Vocational Education The Bonch-Bruevich Saint-Petersburg State University of Telecommunications)

Updated 21 Jan 2018 16:58 PST © 2018 Hurricane Electric


 


Кликаем на AS58042


The screenshot shows a web browser window with the URL <https://bgp.he.net>. The page header includes the Hurricane Electric logo and the text "HURRICANE ELECTRIC INTERNET SERVICES". Below the header is a search bar and the text "BGP Toolkit Home".

The main content area is titled "Home" and contains the following text:

Welcome to the Hurricane Electric BGP Toolkit.

You are visiting from **91.238.230.13** 

Announced as **91.238.230.0/24** (State Educational Institution of Higher Vocational Education The Bonch-Bruевич Saint-Petersburg State University of Telecommunications) 

Your ISP is **AS58042** (State Educational Institution of Higher Vocational Education The Bonch-Bruевич Saint-Petersburg State University of Telecommunications) 

Updated 21 Jan 2018 16:58 PST © 2018 Hurricane Electric

On the left side, there is a "Quick Links" menu with the following items:

- [BGP Toolkit Home](#)
- [BGP Prefix Report](#)
- [BGP Peer Report](#)
- [Exchange Report](#)
- [Bogon Routes](#)
- [World Report](#)
- [Multi Origin Routes](#)
- [DNS Report](#)
- [Top Host Report](#)
- [Internet Statistics](#)
- [Looking Glass](#)
- [Network Tools App](#)
- [Free IPv6 Tunnel](#)
- [IPv6 Certification](#)
- [IPv6 Progress](#)
- [Going Native](#)
- [Contact Us](#)

At the bottom left, there are social media icons for Twitter and Facebook.

Кликаем на вкладке Graph v4

The screenshot shows a web browser window with the URL <https://bgp.he.net/AS58042>. The page header includes the Hurricane Electric logo and the text "HURRICANE ELECTRIC INTERNET SERVICES". Below the header, the AS number "AS58042" is displayed along with its full name: "State Educational Institution of Higher Vocational Education The Bonch-Bruевич Saint-Petersburg State University of Telecommunications".

The main content area features a navigation bar with tabs: "AS Info", "Graph v4", "Graph v6", "Prefixes v4", "Prefixes v6", "Peers v4", "Peers v6", "Whois", "IRR", and "IX". The "Graph v4" tab is currently selected.

The "Graph v4" view displays the following statistics:

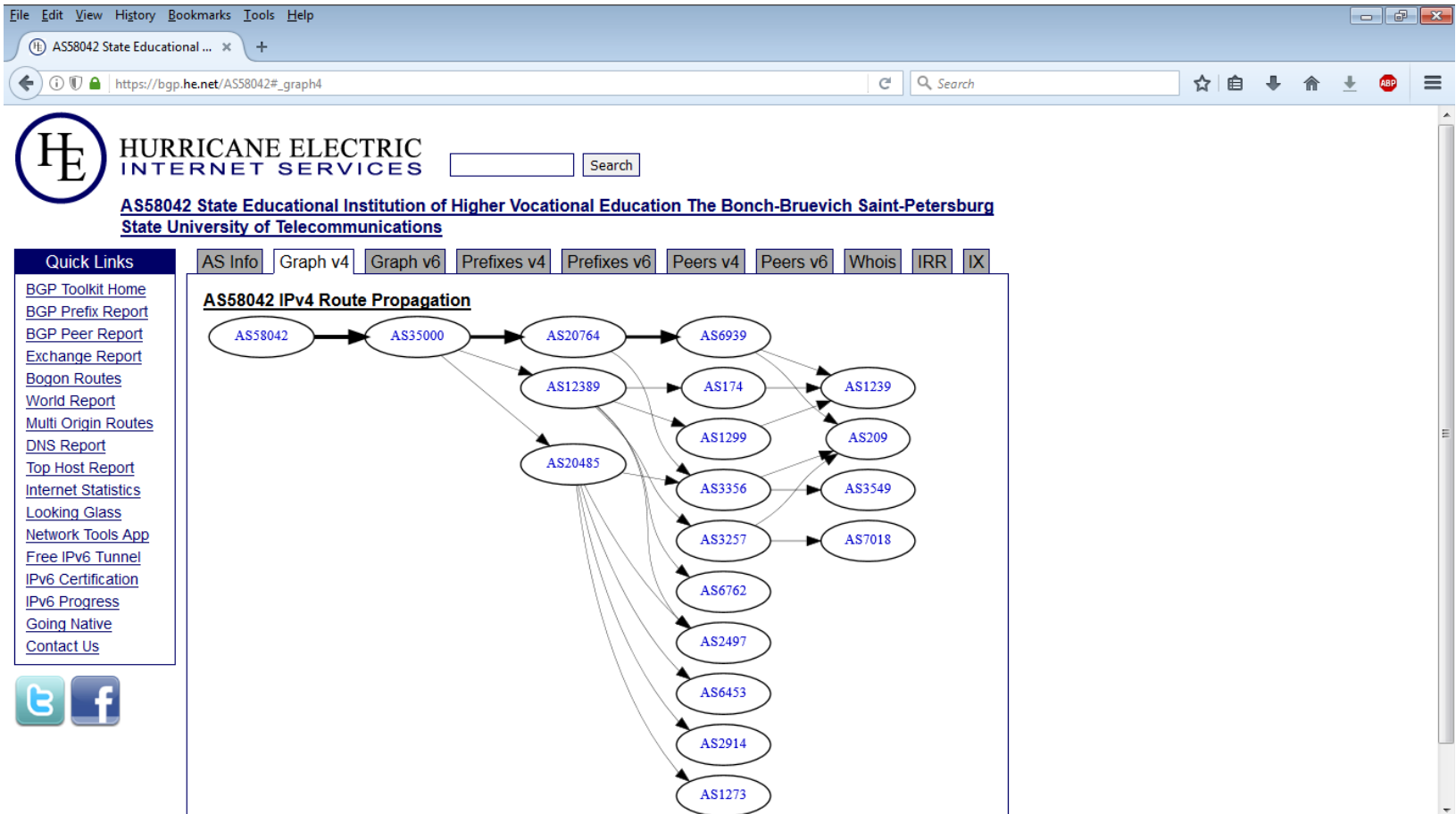
- Country of Origin: Russian Federation (with a small Russian flag icon)
- Internet Exchanges: 2
- Prefixes Originated (all): 4
- Prefixes Originated (v4): 3
- Prefixes Originated (v6): 1
- BGP Peers Observed (all): 2
- BGP Peers Observed (v4): 1
- BGP Peers Observed (v6): 1
- Prefixes Announced (all): 4
- Prefixes Announced (v4): 3
- Prefixes Announced (v6): 1
- IPs Originated (v4): 1,024
- AS Paths Observed (v4): 362
- AS Paths Observed (v6): 282
- Average AS Path Length (all): 4.652
- Average AS Path Length (v4): 4.738
- Average AS Path Length (v6): 4.543

Below the statistics, there is a section titled "AS58042 IPv4 Peers" which includes a pie chart showing "AS35000 100%". To the right of the pie chart is a table listing the peer ASNs:

ASN	Name
AS35000	Prometev LLC

On the left side of the page, there is a "Quick Links" sidebar with various links such as "BGP Toolkit Home", "BGP Prefix Report", "BGP Peer Report", "Exchange Report", "Bogon Routes", "World Report", "Multi Origin Routes", "DNS Report", "Top Host Report", "Internet Statistics", "Looking Glass", "Network Tools App", "Free IPv6 Tunnel", "IPv6 Certification", "IPv6 Progress", "Going Native", and "Contact Us". There are also social media icons for Twitter and Facebook.

Российская сторона цепочки



Ищем IP-адрес www.tut.fi

```
C:\Users\RAD>tracert www.tut.fi
```

```
Tracing route to www.tut.fi [130.230.137.61]
```

```
over a maximum of 30 hops:
```

```
 1  *    *    *    Request timed out.
 2  1 ms  1 ms  <1 ms  wifi.loc [172.16.1.1]
 3  1 ms  1 ms  1 ms  gw-b22.spbsut.ru [91.238.230.1]
 4  2 ms  2 ms  4 ms  p2p.85.235.198.53.ptspb.net [85.235.198.53]
 5  2 ms  2 ms  2 ms  mx480-mm11.p2p.mx240-b57.ptspb.net [188.227.25.33]
 6  9 ms  10 ms 10 ms  193.106.112.103
 7  24 ms 20 ms 21 ms  80-64-96-229.rascom.as20764.net [80.64.96.229]
 8  20 ms 20 ms 20 ms  80-64-96-229.rascom.as20764.net [80.64.96.229]
 9  20 ms 20 ms 20 ms  se-fre.nordu.net [195.69.119.24]
10  26 ms 26 ms 26 ms  ndn-gw.funet.fi [109.105.102.105]
11  32 ms 28 ms 28 ms  tut6-et-0-1-0-1.ip.funet.fi [193.166.255.51]
12  29 ms 28 ms 28 ms  surf-gw-xe-0-0-0.cc.tut.fi [130.230.1.238]
13  29 ms 29 ms 29 ms  fw1.tut.fi [130.230.1.18]
14  29 ms 29 ms 29 ms  tend-gw-vlan558.av.tut.fi [130.230.1.29]
15  30 ms 29 ms 30 ms  www.tut.fi [130.230.137.61]
```

Вставляем IP-адрес > Search

The screenshot shows a web browser window with the URL <https://bgp.he.net/ip/130.230.137.61>. The page header features the Hurricane Electric logo and a search bar. Below the header, the IP address **130.230.137.61** is displayed. A navigation menu includes tabs for IP Info, Whois, DNS, and RBL. The main content area shows the IP address with its associated website www.tut.fi. A table titled "Announced By" provides details on the origin AS and the announcement. The table indicates that the IP is announced by AS1739 (Tampere University of Technology) for the prefix 130.230.0.0/16. Below the table, it states "Address has 0 hosts associated with it." A footer note indicates the page was updated on 21 Jan 2018 at 16:58 PST. On the left side, there is a "Quick Links" menu with various utility links. At the bottom left, there are social media icons for Twitter and Facebook.

HURRICANE ELECTRIC
INTERNET SERVICES

130.230.137.61

Quick Links

- [BGP Toolkit Home](#)
- [BGP Prefix Report](#)
- [BGP Peer Report](#)
- [Exchange Report](#)
- [Bogon Routes](#)
- [World Report](#)
- [Multi Origin Routes](#)
- [DNS Report](#)
- [Top Host Report](#)
- [Internet Statistics](#)
- [Looking Glass](#)
- [Network Tools App](#)
- [Free IPv6 Tunnel](#)
- [IPv6 Certification](#)
- [IPv6 Progress](#)
- [Going Native](#)
- [Contact Us](#)

IP Info | Whois | DNS | RBL

130.230.137.61 (www.tut.fi)

Announced By		
Origin AS	Announcement	Description
AS1739	130.230.0.0/16	Tampere University of Technology

Address has 0 hosts associated with it.

Updated 21 Jan 2018 16:58 PST © 2018 Hurricane Electric

Кликаем на AS1739

The screenshot shows a web browser window with the URL <https://bgp.he.net/ip/130.230.137.61>. The page header features the Hurricane Electric logo and the text "HURRICANE ELECTRIC INTERNET SERVICES". Below the header, the IP address "130.230.137.61" is displayed. A navigation bar includes tabs for "IP Info", "Whois", "DNS", and "RBL", with "IP Info" selected. The main content area shows the IP address "130.230.137.61 (www.tut.fi)" and a table titled "Announced By".

Origin AS	Announcement	Description
AS1739	130.230.0.0/16	Tampere University of Technology

Address has 0 hosts associated with it.

Updated 21 Jan 2018 16:58 PST © 2018 Hurricane Electric

On the left side, there is a "Quick Links" menu with various links such as "BGP Toolkit Home", "BGP Prefix Report", "BGP Peer Report", "Exchange Report", "Bogon Routes", "World Report", "Multi Origin Routes", "DNS Report", "Top Host Report", "Internet Statistics", "Looking Glass", "Network Tools App", "Free IPv6 Tunnel", "IPv6 Certification", "IPv6 Progress", "Going Native", and "Contact Us". At the bottom left, there are social media icons for Twitter and Facebook.

Кликаем на вкладке Graph v4

File Edit View History Bookmarks Tools Help

AS1739 TUT - bgp.he.net

https://bgp.he.net/AS1739

HE HURRICANE ELECTRIC
INTERNET SERVICES

AS1739 TUT

Quick Links

- [BGP Toolkit Home](#)
- [BGP Prefix Report](#)
- [BGP Peer Report](#)
- [Exchange Report](#)
- [Bogon Routes](#)
- [World Report](#)
- [Multi Origin Routes](#)
- [DNS Report](#)
- [Top Host Report](#)
- [Internet Statistics](#)
- [Looking Glass](#)
- [Network Tools App](#)
- [Free IPv6 Tunnel](#)
- [IPv6 Certification](#)
- [IPv6 Progress](#)
- [Going Native](#)
- [Contact Us](#)

AS Info **Graph v4** Prefixes v4 Peers v4 Whois IRR

Country of Origin: Finland

Prefixes Originated (all): 2	Prefixes Announced (all): 2
Prefixes Originated (v4): 2	Prefixes Announced (v4): 2
Prefixes Originated (v6): 0	Prefixes Announced (v6): 0

BGP Peers Observed (all): 1	IPs Originated (v4): 65,792
BGP Peers Observed (v4): 1	AS Paths Observed (v4): 303
BGP Peers Observed (v6): 0	AS Paths Observed (v6): 0

Average AS Path Length (all): 5.125
Average AS Path Length (v4): 5.125
Average AS Path Length (v6): 0.000

AS1739 IPv4 Peers

ASN	Name
AS1741	CSC - Tieteen tietotekniikan keskus Oy

AS1741 100%

Финская сторона цепочки

The screenshot shows a web browser window with the URL https://bgp.he.net/AS1739#_graph4. The page header includes the Hurricane Electric logo and navigation tabs: AS Info, Graph v4, Prefixes v4, Peers v4, Whois, and IRR. The main content area displays the title "AS1739 IPv4 Route Propagation" and a network diagram. The diagram illustrates the route propagation path from AS1739 to AS1741, then to AS2603, which in turn propagates routes to a group of ASes including AS1299, AS6461, AS6939, AS2497, AS6762, AS1239, AS209, AS2914, AS3257, AS6453, and AS7018. A sidebar on the left contains "Quick Links" such as BGP Toolkit Home, BGP Prefix Report, and BGP Peer Report. Social media icons for Twitter and Facebook are visible at the bottom left. A footer note states "Updated 21 Jan 2018 16:58 PST © 2018 Hurricane Electric".

AS1739 IPv4 Route Propagation

```
graph LR; AS1739 --> AS1741; AS1741 --> AS2603; AS2603 --> AS1299; AS2603 --> AS6461; AS2603 --> AS6939; AS2603 --> AS2497; AS2603 --> AS6762; AS1299 --> AS1239; AS1299 --> AS209; AS1299 --> AS2914; AS1299 --> AS3257; AS1299 --> AS6453; AS1299 --> AS7018;
```

Updated 21 Jan 2018 16:58 PST © 2018 Hurricane Electric

Вычисляем по IP 😊

- Поочередно на сайте bgr.he.net проверяем IP-адреса из полученной трассировки, определяем номера AS и названия операторов:
 - 91.238.230.1 = AS58042 = SUT Bonch-Bruevich
 - 85.235.198.53 = AS35000 = Prometey LLC
 - 188.227.25.33 = AS35000 = Prometey LLC
 - 193.106.112.103 = ??? (ничего страшного, бывает)
 - 80.64.96.229 = AS20764 = CJSC RASCOM
 - 195.69.119.24 = AS47872 = NETNOD (хм, такого нет на схеме с российской стороны...)

Что за NETNOD и зачем он здесь?

The screenshot shows a web browser window with the URL <https://bgp.he.net/ip/195.69.119.24>. The page header features the Hurricane Electric logo and the text "HURRICANE ELECTRIC INTERNET SERVICES". A search bar contains the IP address "195.69.119.24".

On the left side, there is a "Quick Links" menu with the following items:

- [BGP Toolkit Home](#)
- [BGP Prefix Report](#)
- [BGP Peer Report](#)
- [Exchange Report](#)
- [Bogon Routes](#)
- [World Report](#)
- [Multi Origin Routes](#)
- [DNS Report](#)
- [Top Host Report](#)
- [Internet Statistics](#)
- [Looking Glass](#)
- [Network Tools App](#)
- [Free IPv6 Tunnel](#)
- [IPv6 Certification](#)
- [IPv6 Progress](#)
- [Going Native](#)
- [Contact Us](#)

The main content area displays the IP address "195.69.119.24 (se-fre.nordu.net)" and a table titled "Announced By".

Origin AS	Announcement	Description
AS12445	195.0.0.0/8	To determine the registration information for a more
AS47872	195.69.119.0/24	NETNOD Internet Exchange i Sverige AB

Below the table, it states: "Address has 0 hosts associated with it."

At the bottom of the page, there is a footer: "Updated 21 Jan 2018 16:58 PST © 2018 Hurricane Electric".

At the bottom left, there are social media icons for Twitter and Facebook.

Ищем в Google

File Edit View History Bookmarks Tools Help

NETNOD - Поиск в Google

https://www.google.ru/search?q=NETNOD&ie=utf-8&oe=utf-8&client=firefox-b-ab&gfe_rd=cr&dcr=0&ei=M-xlWqvlPIrBsAHFuZy'

NETNOD

Войти

Все Картинки Новости Карты Покупки Ещё Настройки Инструменты

Результатов: примерно 125 000 (0,44 сек.)

Netnod
<https://www.netnod.se/> ▾ Перевести эту страницу
Netnod manages Internet Exchange points (IXPs) in Sweden and Denmark, offers DNS anycast & unicast slave services to TLDs and is the operator of i.root-servers.net, one of 13 logistical DNS root name servers.

Netnod IX Copenhagen
With distributed Internet Exchange (IX) infrastructure and ...

IX
Netnod IX - join the largest IXP in Northern Europe.

Netnod IX technical information
Netnod IX technical information.
Swedish national Internet ...

[Другие результаты с сайта netnod.se »](#)

Peering with Netnod
Peering with Netnod. These are the basic facts and information ...

Netnod - working at core of the ...
Netnod - working at core of the Internet. Netnod is neutral and ...

Connect
Connect to Netnod IX. With more than 20 years of experience ...

Netnod - Wikipedia
<https://en.wikipedia.org/wiki/Netnod> ▾ Перевести эту страницу
Netnod Internet Exchange i Sverige is a non-profit, neutral and independent Internet infrastructure organisation based in Sweden. Netnod is owned by the foundation TU-stiftelsen (Stiftelsen för Telematikens utveckling). Netnod operates six Internet exchange points (IXPs) in five different cities where Internet operators can ...
[History](#) · [Autonomica](#) · [Redundancy and physical ...](#) · [Technology](#)

Looking for results in English? ✕
[Change to English](#)
[Оставить русский](#)
[Изменить язык](#)

Netnod

Дата основания: 1996 г.

[Отказ от обязательств](#) [Оставить отзыв](#)

Заходим на сайт NETNOD

File Edit View History Bookmarks Tools Help

IX Networks | Netnod

https://www.netnod.se/ix/networks

About News Events Meet us Contact Log in

NETNOD

IX DNS I-root NTP

Connect Optical IX Networks Reach Statistics Pricing Tech info

IX Networks

Below is a list over the networks that are connected to Netnod Internet Exchange. You can sort them by AS number, location, peering policy or port speed...

SHARE

TAGS

IX

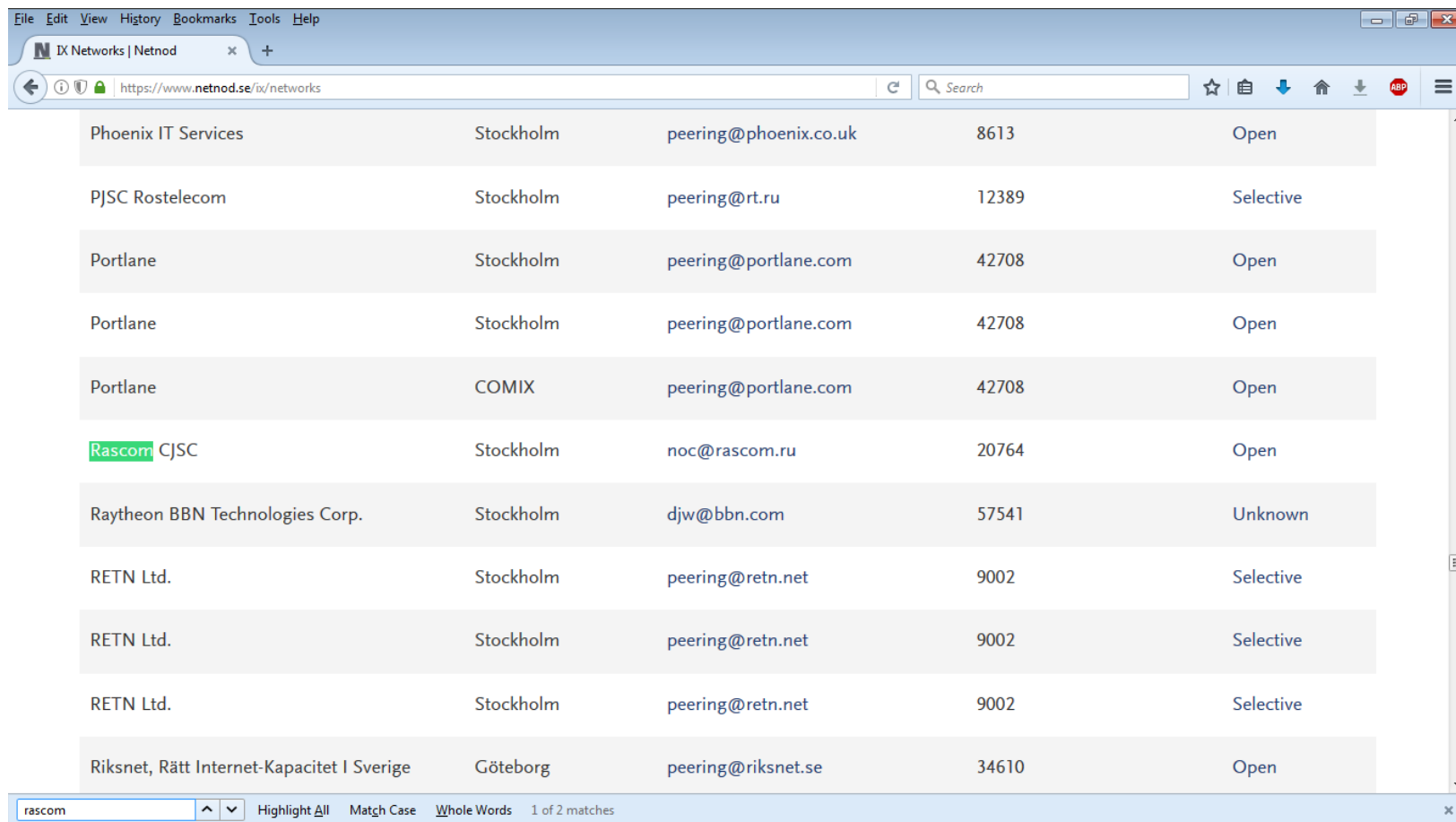
Last update

Monday, January 22, 2018 - 05:15

The table is available as

- > TSV
- > asci

В списке сетей есть наш RASCOM

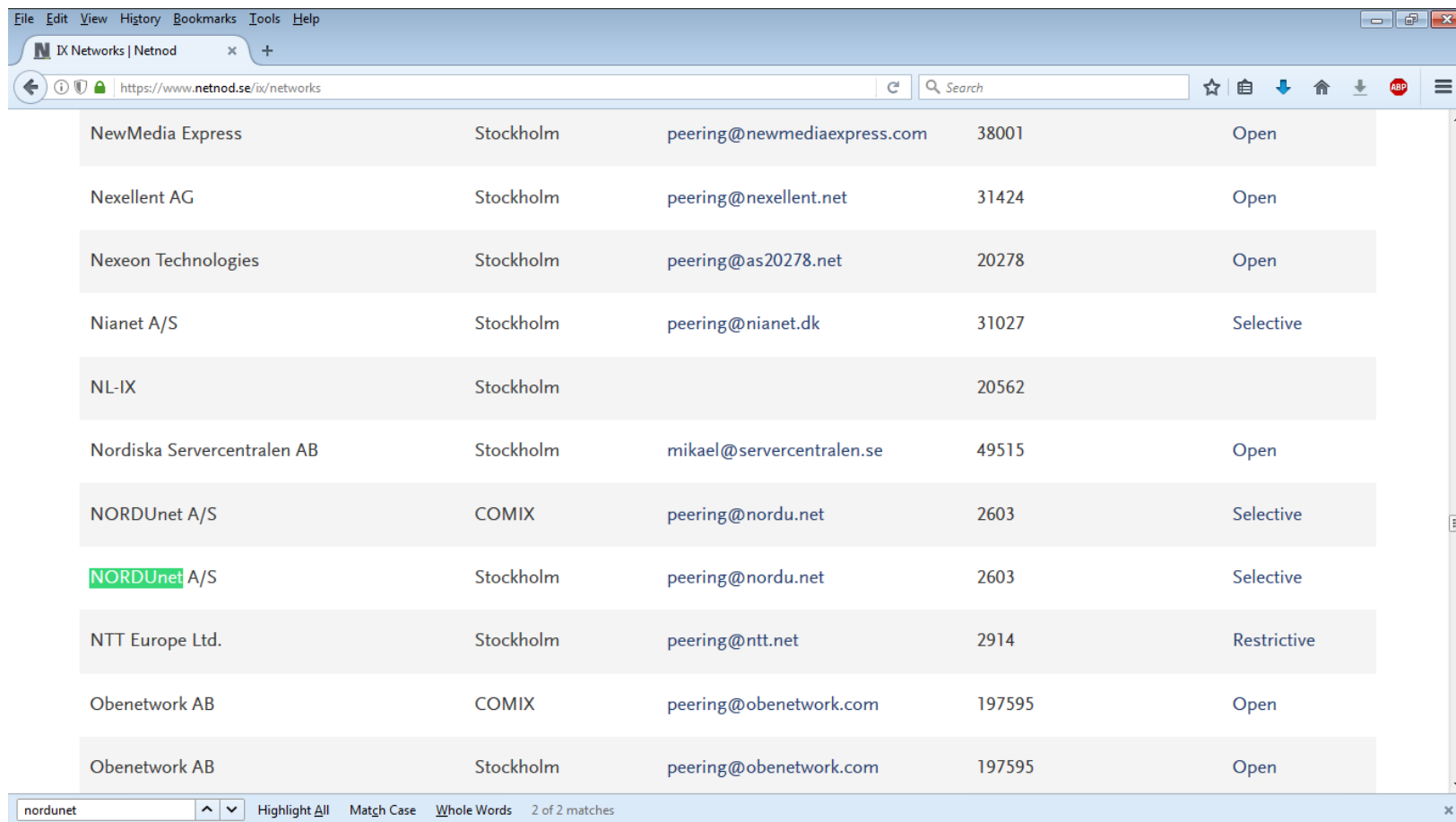


The screenshot shows a web browser window displaying a list of network peering partners. The browser's address bar shows the URL <https://www.netnod.se/ix/networks>. The list contains the following entries:

Organization	Location	Contact Email	AS Number	Status
Phoenix IT Services	Stockholm	peering@phoenix.co.uk	8613	Open
PJSC Rostelecom	Stockholm	peering@rt.ru	12389	Selective
Portlane	Stockholm	peering@portlane.com	42708	Open
Portlane	Stockholm	peering@portlane.com	42708	Open
Portlane	COMIX	peering@portlane.com	42708	Open
Rascom CJSC	Stockholm	noc@rascom.ru	20764	Open
Raytheon BBN Technologies Corp.	Stockholm	djw@bbn.com	57541	Unknown
RETN Ltd.	Stockholm	peering@retn.net	9002	Selective
RETN Ltd.	Stockholm	peering@retn.net	9002	Selective
RETN Ltd.	Stockholm	peering@retn.net	9002	Selective
Riksnät, Rätt Internet-Kapacitet I Sverige	Göteborg	peering@riksnet.se	34610	Open

At the bottom of the browser window, a search bar contains the text "rascom" and shows "1 of 2 matches".

А вот и NORDUnet нашелся



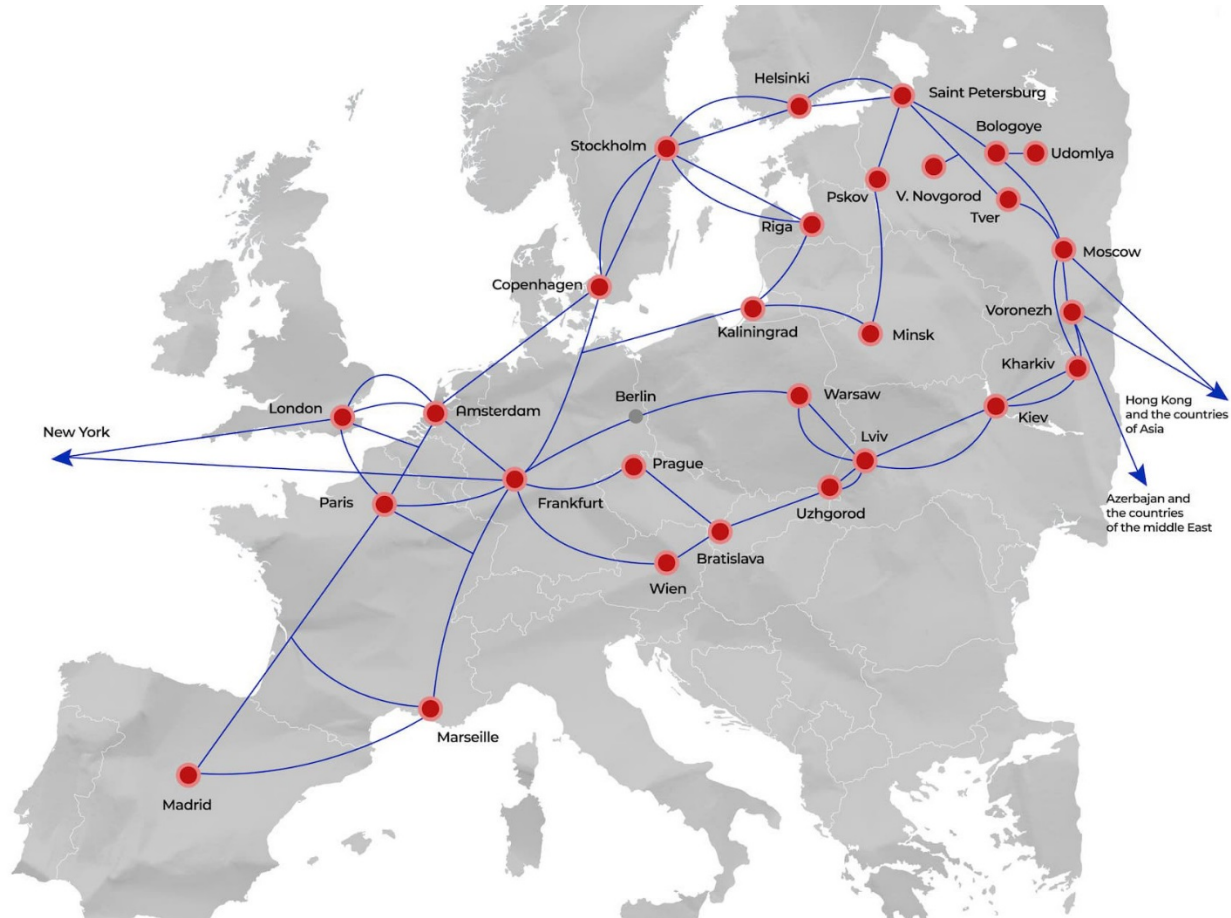
The screenshot shows a web browser window displaying the IX Networks | Netnod website. The search results table lists various peering partners. The entry for 'NORDUnet A/S' is highlighted in green, indicating it is the search result.

Organization	Location	Contact Email	AS Number	Peering Policy
NewMedia Express	Stockholm	peering@newmediaexpress.com	38001	Open
Nexellent AG	Stockholm	peering@nexellent.net	31424	Open
Nexeon Technologies	Stockholm	peering@as20278.net	20278	Open
Nianet A/S	Stockholm	peering@nianet.dk	31027	Selective
NL-IX	Stockholm		20562	
Nordiska Servercentralen AB	Stockholm	mikael@servercentralen.se	49515	Open
NORDUnet A/S	COMIX	peering@nordu.net	2603	Selective
NORDUnet A/S	Stockholm	peering@nordu.net	2603	Selective
NTT Europe Ltd.	Stockholm	peering@ntt.net	2914	Restrictive
Obenetwork AB	COMIX	peering@obenetwork.com	197595	Open
Obenetwork AB	Stockholm	peering@obenetwork.com	197595	Open

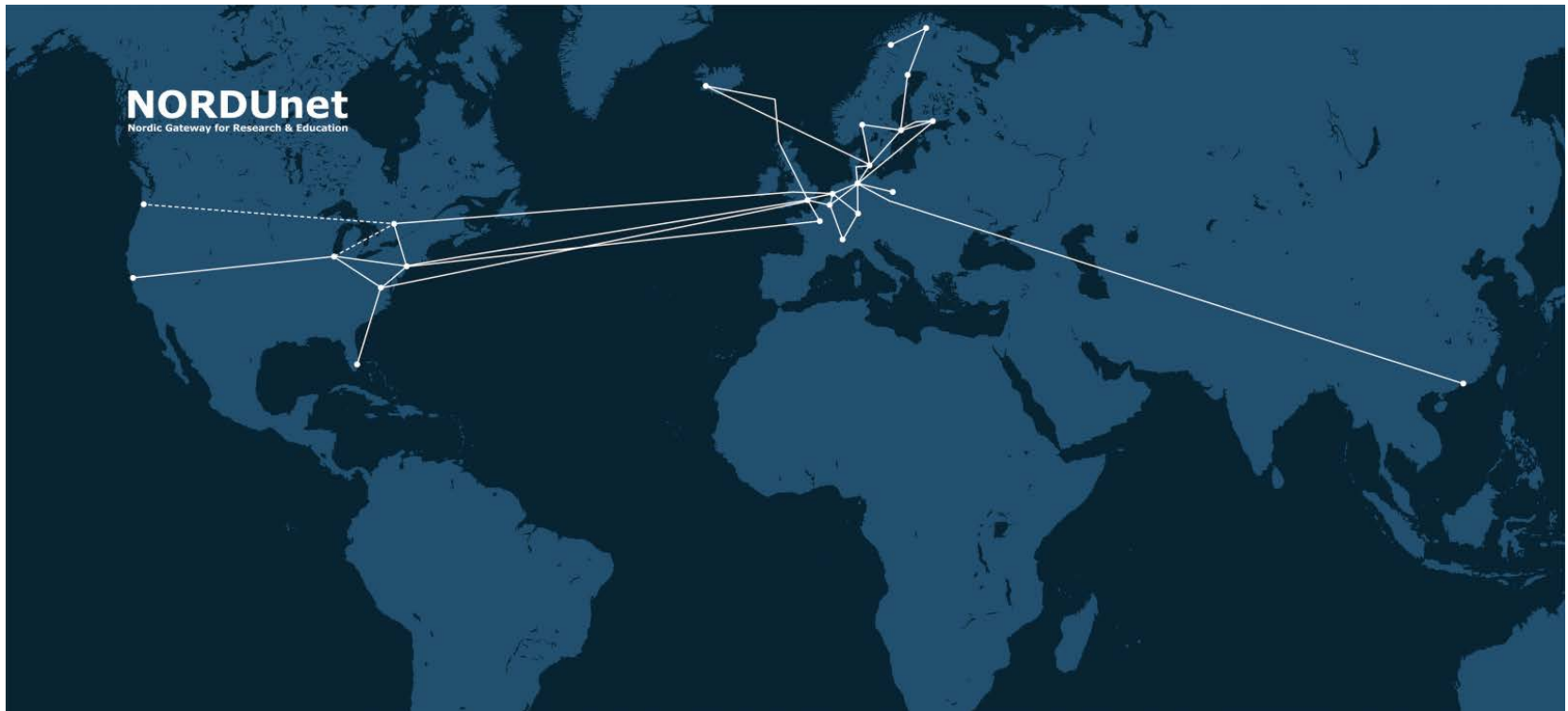
Продолжаем вычислять по IP

- Делаем все то же самое для финской стороны:
 - 109.105.102.105 = AS2603 = NORDUnet
 - 193.166.255.51 = AS1741 = CSC - Tieteen tietotekniikan keskus Oy
 - 130.230.1.238 = AS1739 = Tampere University of Technology
- Итак, до TUT получилась следующая цепочка:
 - AS58042 (SUT) > AS35000 (Prometey) > AS20764 (RASCOM) > AS47872 (NETNOD) > AS2603 (NORDUnet) > AS1741 (CSC) > AS1739 (TUT)
- Причем RASCOM и NORDUnet, Tier-2-операторы, используют пиринг в стокгольмской точке обмена интернет-трафиком, принадлежащей оператору NETNOD

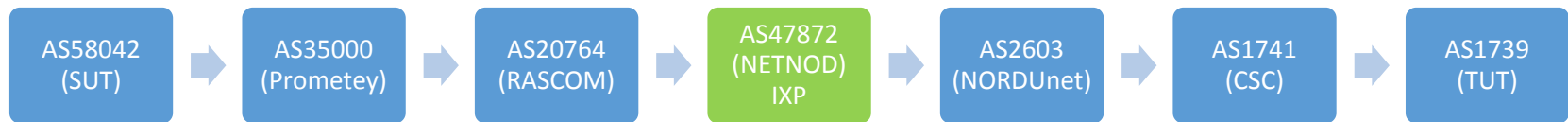
RASCOM



NORDUnet



Маршрут от СПбГУТ до www.tut.fi



Universidad Nacional de Asunción

The screenshot shows the website of the Universidad Nacional de Asunción (UNA) in a web browser. The browser's address bar shows 'www.una.py'. The website header features the UNA logo, the text 'UNA Universidad Nacional de Asunción Fundada en 1889', a search bar, and a 'Select Language' dropdown. A navigation menu includes links for 'Inicio Principal', 'La Universidad Institucional', 'MECIP', 'Unidades Académicas Asuntos Académicos', 'Postgrado Los Cursos', 'Investigación Nuestros Aportes', 'Extensión Ext. Universitaria', and 'Ley 5189/2014 Funcionarios'. The main content area has a red background with the headline 'La UNA recibe oficialmente 17 nuevos certificados de acreditación de la ANEAES'. Below the headline is a paragraph: 'El pasado miércoles 27 de diciembre, la Agencia Nacional de Acreditación y Evaluación de la Educación Superior (ANEAES), entregó un total de 17 nuevos Certificados de Acreditación de carreras de las diferentes Unidades Académicas de la Universidad Nacional de Asunción (UNA); 14 de las acreditaciones corresponden al Modelo Nacional y tres, al Sistema ARCU-SUR.' To the right of the text is a photograph of a group of people holding yellow certificates. Below the main text is a 'Leer más...' link. At the bottom, there are four small news items: 'Buscan optimizar medidas de bioseguridad en la Facultad de Ciencias', 'La UNA recibe oficialmente 17 nuevos certificados de...', 'Entregan reconocimiento a los profesores y evaluadores de las VIII', and 'Docentes y estudiantes trabajan proyectos en conjunto'. The footer contains the text 'Servicios Online', 'Novedades', and 'Interesante'.

Трассировка до www.una.py

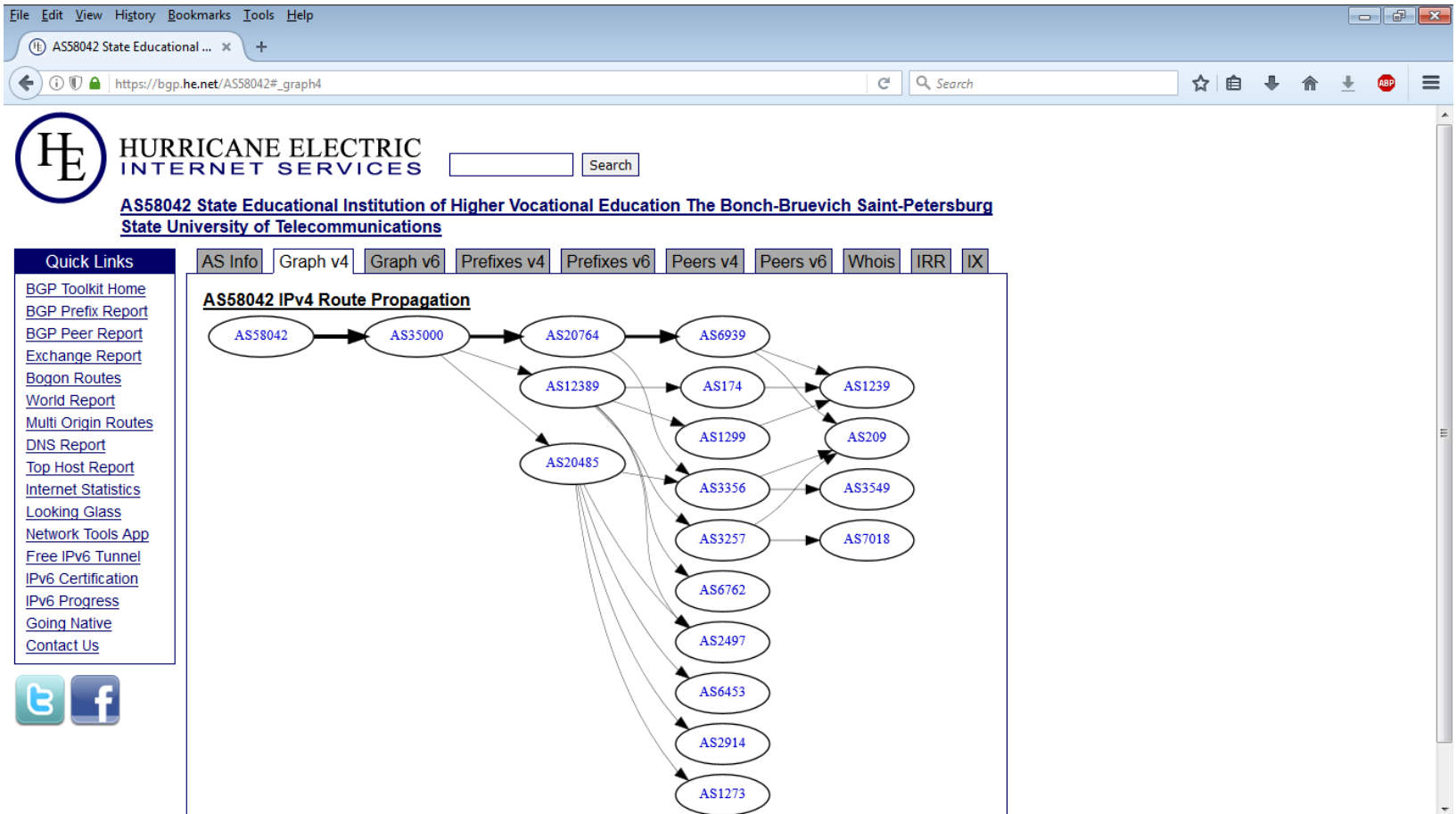
```
1 * * * Request timed out.
2 1 ms 1 ms 1 ms wifi.loc [172.16.1.1]
3 1 ms 1 ms 1 ms gw-b22.spbsut.ru [91.238.230.1]
4 2 ms 3 ms 2 ms p2p.85.235.198.53.ptspb.net [85.235.198.53]
5 2 ms 2 ms 2 ms mx480-mm11.p2p.mx240-b57.ptspb.net [188.227.25.33]
6 2 ms 36 ms 23 ms rostelecom-as.as12389.ptspb.net [85.235.192.174]
7 79 ms 61 ms 60 ms 87.226.181.65
8 44 ms 44 ms 44 ms ix-et-8-1-0-0.tcore2.fnm-frankfurt.as6453.net [195.219.36.33]
9 162 ms 161 ms 161 ms if-ae-9-2.tcore1.pvu-paris.as6453.net [195.219.87.10]
10 250 ms 196 ms 233 ms if-ae-11-2.tcore1.pye-paris.as6453.net [80.231.153.50]
11 248 ms 204 ms 204 ms if-ae-3-2.tcore1.l78-london.as6453.net [80.231.154.143]
12 217 ms 204 ms 204 ms if-ae-4-2.thar1.njy-newark.as6453.net [80.231.130.34]
13 218 ms 203 ms 203 ms if-ae-1-3.thar2.njy-newark.as6453.net [216.6.57.2]
14 159 ms 160 ms 159 ms if-ae-11-2.tcore2.aeq-ashburn.as6453.net [216.6.87.241]
15 160 ms 159 ms 160 ms if-ae-2-2.tcore1.aeq-ashburn.as6453.net [216.6.87.2]
16 163 ms 162 ms 163 ms if-ae-7-2.tcore1.mln-miami.as6453.net [66.198.154.178]
17 178 ms 178 ms 178 ms if-ge-11-0-0.core5.mln-miami.as6453.net [63.243.152.10]
18 315 ms 310 ms 309 ms 216.6.48.54
19 311 ms 312 ms 311 ms host-1.0.217.201.copaco.com.py [201.217.0.1]
20 311 ms 311 ms 311 ms host-122.0.217.201.copaco.com.py [201.217.0.122]
21 * * * Request timed out.
22 * * * Request timed out.
23 * * * Request timed out.
24 376 ms 377 ms 426 ms host-45.5.217.201.copaco.com.py [201.217.5.45]
25 439 ms 409 ms 408 ms host-46.5.217.201.copaco.com.py [201.217.5.46]
26 * * * Request timed out.
27 366 ms 371 ms 370 ms www.una.py [200.10.228.139]
```

Trace complete.

СПБГУТ им. М.А. Бонч-Бруевича

The screenshot shows a web browser window with the address bar displaying `https://bgp.he.net`. The page header includes the Hurricane Electric logo and the text "HURRICANE ELECTRIC INTERNET SERVICES" with a search box. Below the header is a "BGP Toolkit Home" section with a "Quick Links" sidebar containing various tool links such as "BGP Toolkit Home", "BGP Prefix Report", "BGP Peer Report", "Exchange Report", "Bogon Routes", "World Report", "Multi Origin Routes", "DNS Report", "Top Host Report", "Internet Statistics", "Looking Glass", "Network Tools App", "Free IPv6 Tunnel", "IPv6 Certification", "IPv6 Progress", "Going Native", and "Contact Us". The main content area displays a "Home" tab and a welcome message: "Welcome to the Hurricane Electric BGP Toolkit." It also shows the user's IP address as `91.238.230.13` with a Russian flag icon, and their ISP as `AS58042` (State Educational Institution of Higher Vocational Education The Bonch-Bruевич Saint-Petersburg State University of Telecommunications) with another Russian flag icon. The footer of the page indicates it was updated on 21 Jan 2018 at 16:58 PST © 2018 Hurricane Electric. Social media icons for Twitter and Facebook are visible at the bottom left.

Российская часть схемы все та же



Ищем IP-адрес www.una.py

```
1 * * * Request timed out.
2 1 ms 1 ms 1 ms wifi.loc [172.16.1.1]
3 1 ms 1 ms 1 ms gw-b22.spbsut.ru [91.238.230.1]
4 2 ms 3 ms 2 ms p2p.85.235.198.53.ptspb.net [85.235.198.53]
5 2 ms 2 ms 2 ms mx480-mm11.p2p.mx240-b57.ptspb.net [188.227.25.33]
6 2 ms 36 ms 23 ms rostelecom-as.as12389.ptspb.net [85.235.192.174]
7 79 ms 61 ms 60 ms 87.226.181.65
8 44 ms 44 ms 44 ms ix-et-8-1-0-0.tcore2.fnm-frankfurt.as6453.net [195.219.36.33]
9 162 ms 161 ms 161 ms if-ae-9-2.tcore1.pvu-paris.as6453.net [195.219.87.10]
10 250 ms 196 ms 233 ms if-ae-11-2.tcore1.pye-paris.as6453.net [80.231.153.50]
11 248 ms 204 ms 204 ms if-ae-3-2.tcore1.l78-london.as6453.net [80.231.154.143]
12 217 ms 204 ms 204 ms if-ae-4-2.thar1.njy-newark.as6453.net [80.231.130.34]
13 218 ms 203 ms 203 ms if-ae-1-3.thar2.njy-newark.as6453.net [216.6.57.2]
14 159 ms 160 ms 159 ms if-ae-11-2.tcore2.aeq-ashburn.as6453.net [216.6.87.241]
15 160 ms 159 ms 160 ms if-ae-2-2.tcore1.aeq-ashburn.as6453.net [216.6.87.2]
16 163 ms 162 ms 163 ms if-ae-7-2.tcore1.mln-miami.as6453.net [66.198.154.178]
17 178 ms 178 ms 178 ms if-ge-11-0-0.core5.mln-miami.as6453.net [63.243.152.10]
18 315 ms 310 ms 309 ms 216.6.48.54
19 311 ms 312 ms 311 ms host-1.0.217.201.copaco.com.py [201.217.0.1]
20 311 ms 311 ms 311 ms host-122.0.217.201.copaco.com.py [201.217.0.122]
21 * * * Request timed out.
22 * * * Request timed out.
23 * * * Request timed out.
24 376 ms 377 ms 426 ms host-45.5.217.201.copaco.com.py [201.217.5.45]
25 439 ms 409 ms 408 ms host-46.5.217.201.copaco.com.py [201.217.5.46]
26 * * * Request timed out.
27 366 ms 371 ms 370 ms www.una.py [200.10.228.139]
```

Trace complete.

Вставляем IP-адрес > Search

The screenshot shows a web browser window with the URL <https://bgp.he.net/ip/200.10.228.139>. The page header features the Hurricane Electric logo and the text "HURRICANE ELECTRIC INTERNET SERVICES". A search bar contains the IP address "200.10.228.139" and a "Search" button. Below the header, there are navigation tabs for "IP Info", "Whois", "DNS", and "RBL". The "IP Info" tab is active, displaying the IP address "200.10.228.139 (www.una.py)". A table titled "Announced By" shows the following data:

Origin AS	Announcement	Description
AS27733	200.10.228.0/22	Centro Nacional de Computacion

Below the table, it states "Address has 0 hosts associated with it." At the bottom of the page, there is a timestamp: "Updated 21 Jan 2018 16:58 PST © 2018 Hurricane Electric". On the left side, there is a "Quick Links" menu with various links such as "BGP Toolkit Home", "BGP Prefix Report", "BGP Peer Report", "Exchange Report", "Bogon Routes", "World Report", "Multi Origin Routes", "DNS Report", "Top Host Report", "Internet Statistics", "Looking Glass", "Network Tools App", "Free IPv6 Tunnel", "IPv6 Certification", "IPv6 Progress", "Going Native", and "Contact Us". At the bottom left, there are social media icons for Twitter and Facebook.

Кликаем на AS27733

The screenshot shows a web browser window with the URL <https://bgp.he.net/ip/200.10.228.139>. The page header includes the Hurricane Electric logo and the text "HURRICANE ELECTRIC INTERNET SERVICES". A search bar contains the IP address "200.10.228.139".

On the left side, there is a "Quick Links" menu with the following items:

- [BGP Toolkit Home](#)
- [BGP Prefix Report](#)
- [BGP Peer Report](#)
- [Exchange Report](#)
- [Bogon Routes](#)
- [World Report](#)
- [Multi Origin Routes](#)
- [DNS Report](#)
- [Top Host Report](#)
- [Internet Statistics](#)
- [Looking Glass](#)
- [Network Tools App](#)
- [Free IPv6 Tunnel](#)
- [IPv6 Certification](#)
- [IPv6 Progress](#)
- [Going Native](#)
- [Contact Us](#)

The main content area displays "IP Info" for "200.10.228.139 (www.una.py)". It includes tabs for "Whois", "DNS", and "RBL". A table titled "Announced By" shows the following data:

Origin AS	Announcement	Description
AS27733	200.10.228.0/22	Centro Nacional de Computacion

Below the table, it states: "Address has 0 hosts associated with it." At the bottom of the page, there is a timestamp: "Updated 21 Jan 2018 16:58 PST © 2018 Hurricane Electric".

Кликаем на вкладке Graph v4

The screenshot shows a web browser window displaying the Hurricane Electric website for AS27733 Centro Nacional de Computacion. The browser's address bar shows the URL <https://bgp.he.net/AS27733>. The page features a navigation menu with tabs for AS Info, Graph v4, Graph v6, Prefixes v4, Prefixes v6, Peers v4, Peers v6, Whois, IRR, and IX. The Graph v4 tab is currently selected. The main content area displays various statistics and a network diagram for the AS.

**HURRICANE ELECTRIC
INTERNET SERVICES**

AS27733 Centro Nacional de Computacion

Quick Links

- [BGP Toolkit Home](#)
- [BGP Prefix Report](#)
- [BGP Peer Report](#)
- [Exchange Report](#)
- [Bogon Routes](#)
- [World Report](#)
- [Multi Origin Routes](#)
- [DNS Report](#)
- [Top Host Report](#)
- [Internet Statistics](#)
- [Looking Glass](#)
- [Network Tools App](#)
- [Free IPv6 Tunnel](#)
- [IPv6 Certification](#)
- [IPv6 Progress](#)
- [Going Native](#)
- [Contact Us](#)

AS Info | **Graph v4** | Graph v6 | Prefixes v4 | Prefixes v6 | Peers v4 | Peers v6 | Whois | IRR | IX

Company Website: <http://www.cnc.una.py>

Country of Origin: **Paraguay**

Internet Exchanges: 1

Prefixes Originated (all): 2
Prefixes Originated (v4): 1
Prefixes Originated (v6): 1

Prefixes Announced (all): 2
Prefixes Announced (v4): 1
Prefixes Announced (v6): 1

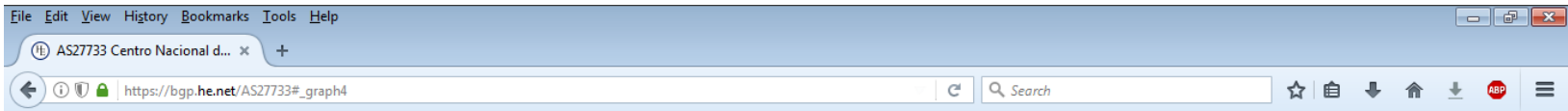
BGP Peers Observed (all): 3
BGP Peers Observed (v4): 3
BGP Peers Observed (v6): 1

IPs Originated (v4): 1,024
AS Paths Observed (v4): 295
AS Paths Observed (v6): 264

Average AS Path Length (all): 5.277
Average AS Path Length (v4): 5.451
Average AS Path Length (v6): 5.083

The network diagram shows the AS structure for CNC. It includes a central node for CNC, connected to several other nodes representing different ISPs or regions. A map of Paraguay is also visible, indicating the geographical location of the AS.

Парагвайская сторона цепочки



HURRICANE ELECTRIC
INTERNET SERVICES

AS27733 Centro Nacional de Computacion

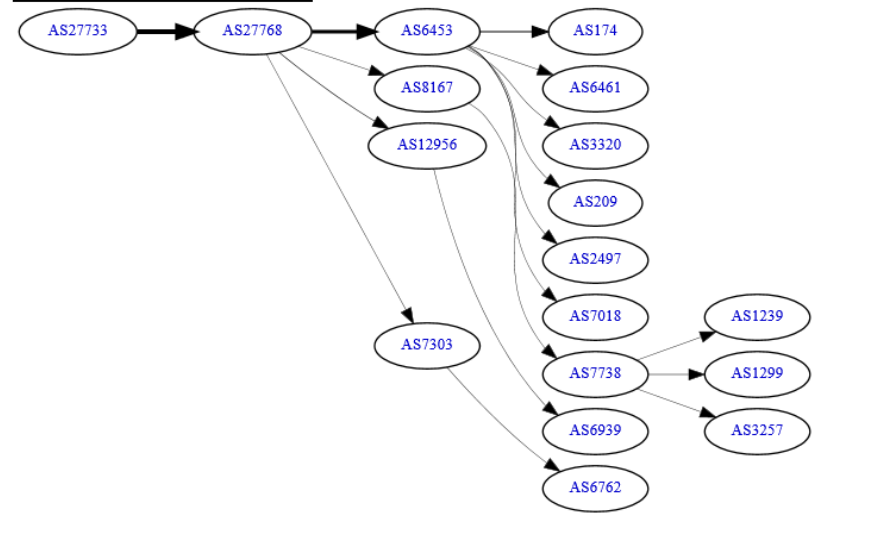
Quick Links

- [BGP Toolkit Home](#)
- [BGP Prefix Report](#)
- [BGP Peer Report](#)
- [Exchange Report](#)
- [Bogon Routes](#)
- [World Report](#)
- [Multi Origin Routes](#)
- [DNS Report](#)
- [Top Host Report](#)
- [Internet Statistics](#)
- [Looking Glass](#)
- [Network Tools App](#)
- [Free IPv6 Tunnel](#)
- [IPv6 Certification](#)
- [IPv6 Progress](#)
- [Going Native](#)
- [Contact Us](#)



AS Info Graph v4 Graph v6 Prefixes v4 Prefixes v6 Peers v4 Peers v6 Whois IRR IX

AS27733 IPv4 Route Propagation



Updated 21 Jan 2018 16:58 PST © 2018 Hurricane Electric

Вновь вычисляем по IP

- Поочередно на сайте bgr.he.net проверяем IP-адреса из полученной трассировки, определяем номера AS и названия операторов:
 - 91.238.230.1 = AS58042 = SUT Bonch-Bruevich
 - 85.235.198.53 = AS35000 = Prometey LLC
 - 188.227.25.33 = AS35000 = Prometey LLC
 - 85.235.192.174 = AS35000 = Prometey LLC
 - 87.226.181.65 = AS12389 = PJSC Rostelecom
 - Российская сторона закончилась, дальше – чужбина 😊

Продолжаем вычислять по IP

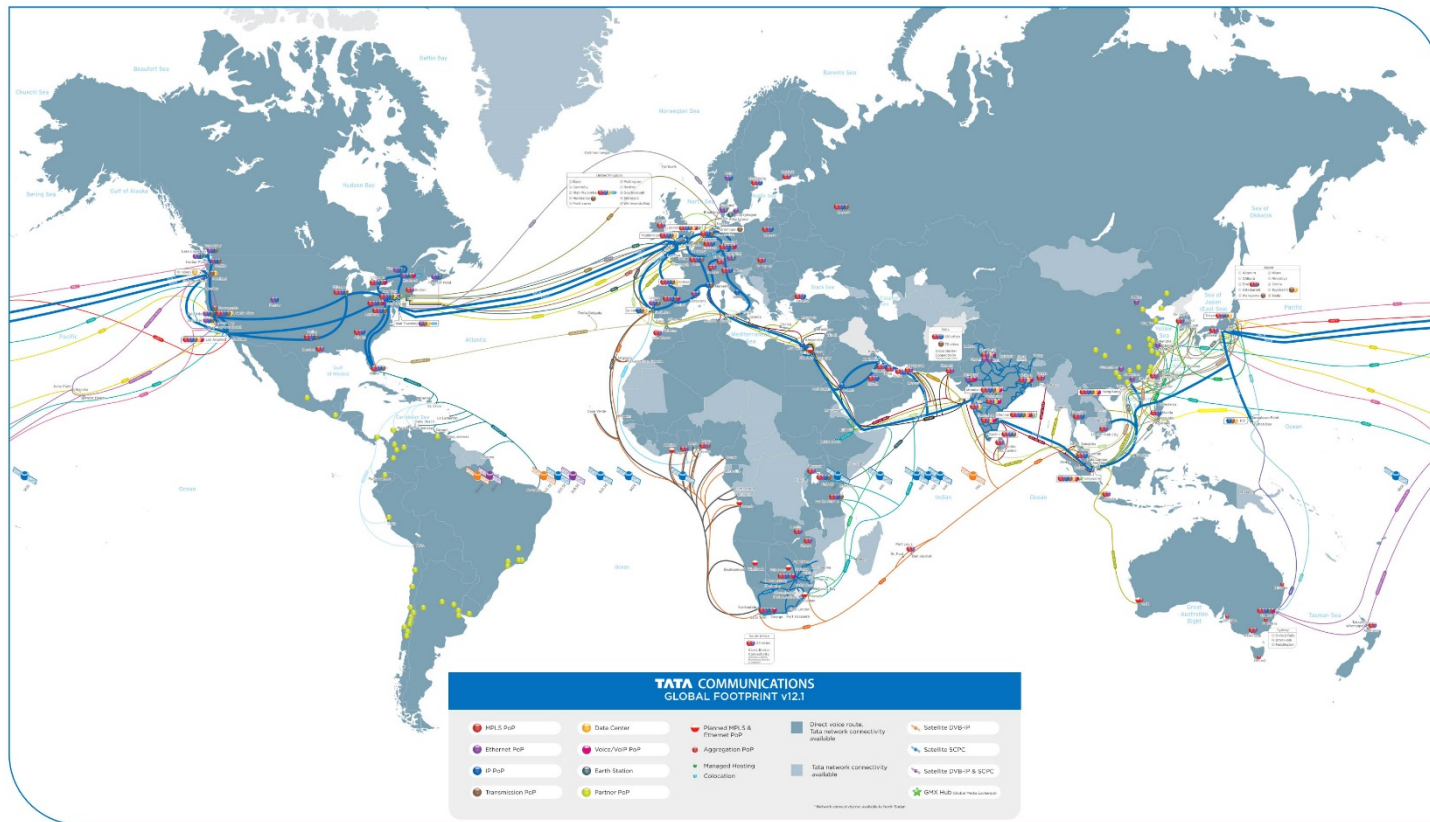
- Делаем все то же самое для заграничной части нашей трассировки:
 - 195.219.36.33 = AS6453 = TATA Communications (Франкфурт)
 - 195.219.87.10 = AS6453 = TATA Communications (Париж)
 - 80.231.153.50 = AS6453 = TATA Communications (Париж)
 - 80.231.154.143 = AS6453 = TATA Communications (Лондон)
 - 80.231.130.34 = AS6453 = TATA Communications (Ньюарк, Нью-Джерси)
 - 216.6.57.2 = AS6453 = TATA Communications (Ньюарк, Нью-Джерси)
 - 216.6.87.241 = AS6453 = TATA Communications (Ашберн, Виргиния)
 - 216.6.87.2 = AS6453 = TATA Communications (Ашберн, Виргиния)
 - 66.198.154.178 = AS6453 = TATA Communications (Майами)
 - 63.243.152.10 = AS6453 = TATA Communications (Майами)
 - 216.6.48.54 = AS6453 = TATA Communications (неизвестно)
 - 201.217.0.1 = AS27768 = CO.PA.CO.
 - 201.217.0.122 = AS27768 = CO.PA.CO.
 - 201.217.5.45 = AS27768 = CO.PA.CO.
 - 201.217.5.46 = AS27768 = CO.PA.CO.
 - 200.10.228.139 = AS27733 = Centro Nacional de Computacion

ГОТОВО!

- Итак, цепочка до UNA получилась такой:
 - AS58042 (SUT) > AS35000 (Prometey) > AS12389 (Rostelecom) > AS6453 (TATA Communications) > AS27768 (CO.PA.CO.) > AS27733 (Centro Nacional de Computacion)
- Причем Tier-2-операторы Rostelecom и CO.PA.CO. между собой пиринга не имеют, а пользуются услугами транзита от Tier-1-оператора TATA Communications
- Информацию об операторах также можно поискать на сайте <https://www.peeringdb.com/>

TATA Communications

TATA COMMUNICATIONS



Маршрут от СПбГУТ до www.una.py

